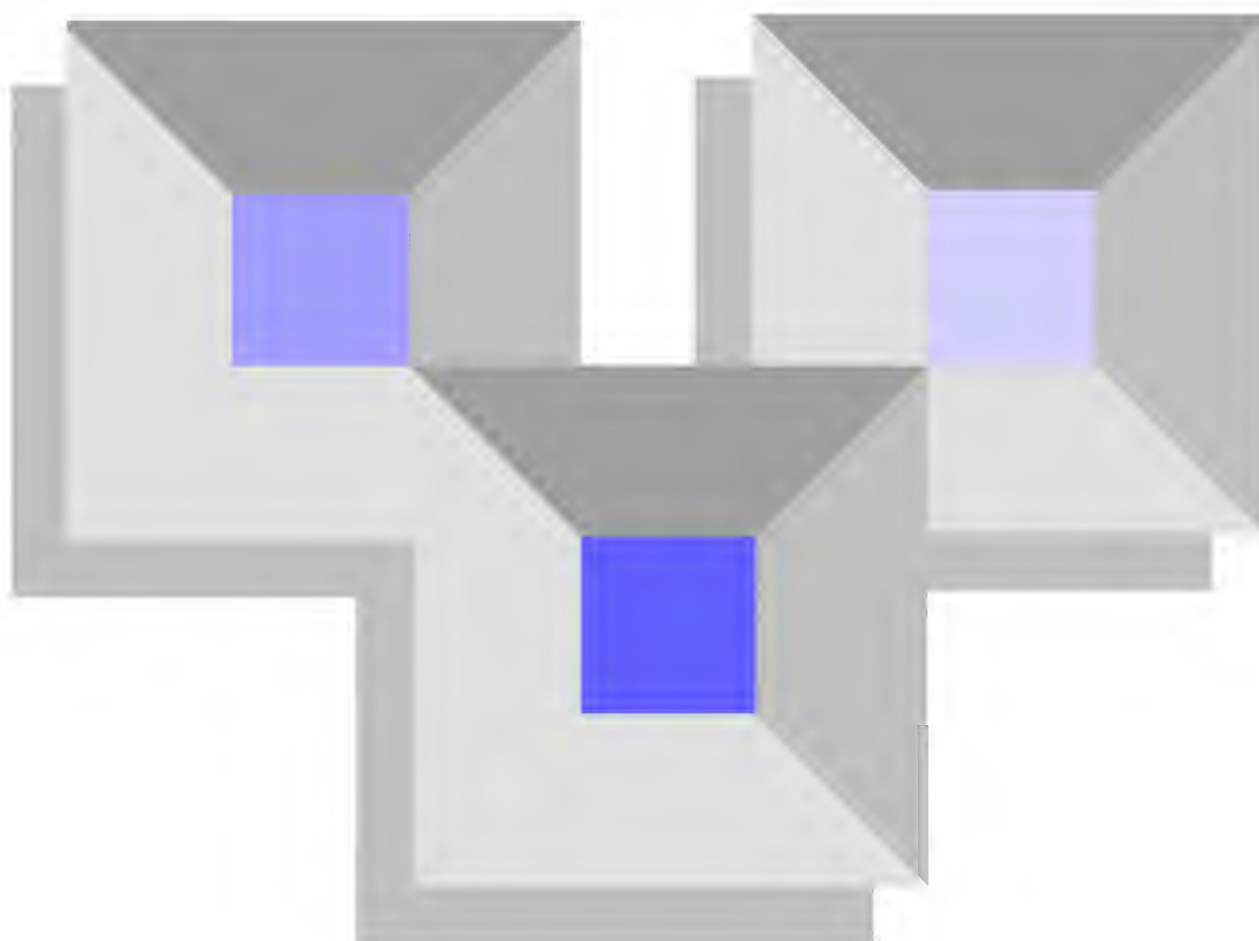


# **Datashare/1000**

## **Reference Manual**





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# PRINTING HISTORY

The Printing History below identifies the Edition of this Manual and any Updates that are included. Periodically, Update packages are distributed which contain replacement pages to be merged into the manual, including an updated copy of this Printing History page. Also, the update may contain write-in instructions.

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# Preface

This manual describes the Datashare/1000 Multi-Computer File Manager package that allows multiple computers to share disc cartridges. Since Datashare/1000 is an extension of the RTE-6/VM Operating System FMGR, features common to both are not repeated in this reference manual. For the most part, the extensions are transparent in both the single-computer and multi-computer applications. This manual will therefore only describe changes in user interface with FMGR commands and RTE-6/VM operating system utilities and library subroutines, and those utilities and subroutines provided specifically for Datashare/1000. Refer to the following RTE-6/VM manuals for details of the common features:

Terminal User's Reference Manual (92084-90004)  
RTE-6/VM Quick Reference Guide (92084-90003)  
Programmer's Reference Manual (92084-90005)  
System Manager's Reference Manual (92084-90009)  
Technical Specifications (92084-90015)

This manual is organized as:

- |            |  |
|------------|--|
| Chapter 1  | introduces Datashare/1000. The functional configuration and hardware requirements are defined, and the new and extended commands, utilities and subroutines are described. |
| Chapter 2  | describes the extensions to FMGR commands for use in a multi-computer environment.   |
| Chapter 3  | describes the new utilities, DCONV and DMALL, provided for Datashare/1000.   |
| Chapter 4  | describes the new subroutines, SIDGP and M.CPU, designed for Datashare/1000, and the extensions to existing subroutine FSTAT.  |
| Chapter 5  | details system generation requirements for Datashare/1000.   |
| Appendix A | illustrates and defines the RTE-6/VM cartridge specification entry and the 16-word expansion used in a multi-computer environment.   |



# Table of Contents

Chapter 1	Page
<b>GENERAL INFORMATION</b>	
Functional Configuration .....	1-1
FMGR Commands .....	1-2
Utilities .....	1-2
Library Subroutines .....	1-2
Software Requirements .....	1-3
Hardware Requirements .....	1-3

Chapter 2	Page
<b>FMGR COMMANDS</b>	
AC (Allocate Cartridge) .....	2-1
CL (Cartridge List) .....	2-3
DC (Dismount Cartridge) .....	2-5
DL (Directory List) .....	2-8
IN (Initialize Cartridge) .....	2-10
MC (Mount Cartridge) .....	2-11
RP (Restore Program) and RU (Run Program) .....	2-13

Chapter 3	Page
<b>UTILITY PROGRAMS</b>	
Directory Conversion Utility DCONV .....	3-1
Running DCONV .....	3-1
Error Messages .....	3-2

Dismount Cartridge Utility DMALL .....	3-3
Running DMALL .....	3-3
Error Messages .....	3-4

Chapter 4	Page
<b>FMP LIBRARY SUBROUTINES</b>	
FSTAT .....	4-1
FSTAT Calling Sequence .....	4-1
ISTAT Return Formats .....	4-2
Format 1 .....	4-2
Format 2 .....	4-3
Format 3 .....	4-3
SIDGP .....	4-4
M.CPU .....	4-4

Chapter 5	Page
<b>SOFTWARE INSTALLATION</b>	
System Generation .....	5-1
User Accounts .....	5-2
Cartridge Status Update .....	5-2
Software Modules .....	5-3

Appendix A	Page
<b>CARTRIDGE SPECIFICATION ENTRY FORMAT</b>	





# Chapter 1

## General Information

Datashare/1000, the Multi-Computer File Management system, is an extension of the standard RTE-6/VM File Manager (FMGR) that allows up to four computers to share disc cartridges and the files that exist on the shared discs. All cartridges, with the exception of the system and auxiliary cartridges (LU 2 and LU 3), can be shared in a multi-computer environment. In a single-computer environment, the multi-computer features are not used and Datashare/1000 functions as the standard RTE-6/VM FMGR.

### Functional Configuration

The multi-computer features are enabled by including a CPU specification in the 'CHANGE ENTS?' portion of the system generation. If an LU is going to be shared in a multi-computer environment, the cartridge-specification entry in the existing cartridge file directory for that LU is expanded from one to two 16-word entries to allow definition of the mount/dismount and lock/unlock status of the shared cartridges, and to identify the related session IDs. The directory-entry expansion is accomplished using the Datashare/1000 utility DCONV or, in systems that include a tape transport, using the RTE-6/VM utility set READT/WRITT. If the LU is not going to be shared in a multi-computer environment, the specification-entry conversion is not required.

LU 2 and LU 3 contain the system tracks. Since the track assignment table is kept in memory, conflicting use of the system tracks cannot be prevented. As a result, LU 2 and LU 3 cannot be shared. Since LU 2 contains the system cartridge list, this list also cannot be shared by other computers or even locally accessible to other computers. Each computer in the multi-computer system then must have a unique, unsharable cartridge list. As a result, mount/dismount operations performed by one computer cannot be posted to the cartridge lists of other computers in the system.

When a system is switched (the operating system is transferred from an external disc to the system disc following on-line generation), the switched-system cartridge list is cleared to indicate that only LU 2 is mounted. However, the unshared disc directories on each cartridge cannot be updated (cleared) by the system switch program SWTCH. Datashare/1000 includes a utility, DMALL, for this purpose. Following initial system boot, DMALL must be executed to clear any mount indicators left on the disc directories from the previous system.

In configuring a system for multi-computer use, the following requirements must be met:

1. Each sharing computer must be uniquely identified at system generation, using a number between 0 and 7.
2. All user and account ID numbers assigned when the accounts are initialized must be identical on all computers. This is best accomplished using the same answer file at all computers. Note that an account assigned at one computer must be identically assigned at all computers.

3. The controller lock can be used *ONLY* by D.RTR and cannot be used by any other programs.
4. Spool cartridges must be uniquely allocated for each computer in a multi-computer system; spool cartridges cannot be shared among computers.

When the configuration conditions are satisfied and the directory conversion and cartridge state update operations are completed, DATASHARE/1000 is transparent to the user.

## FMGR Commands

The following FMGR commands have been extended for use with Datashare/1000 in a multi-computer environment. Refer to Chapter 2 for a detailed description of the extensions to the user interface.

<b>AC</b>	Allocate Cartridge
<b>CL</b>	List Cartridges
<b>DC</b>	Dismount Cartridge
<b>DL</b>	List Directory
<b>IN</b>	Initialize Cartridge
<b>MC</b>	Mount Cartridge
<b>RP</b>	Restore Program
<b>RU</b>	Run Program

## Utilities

Two utilities, DCONV and DMALL, are provided for use with Datashare/1000 in a multi-computer environment. DCONV, the directory conversion utility, converts an existing cartridge specification entry to the 32-word entry required to define multi-computer use. DMALL updates the directory on each cartridge after restoration of LU 2, or after bootup of a switched system, to clear all mount bits left for cartridges that were mounted under the pre-switched system. Refer to Chapter 3 for a detailed description of these utilities.

## Library Subroutines

One library subroutine, FSTAT, was extended for Datashare/1000, and two subroutines, SIDGP and M.CPU, are provided for use in a multi-computer environment. FSTAT returns the cartridge directory to a user buffer, and identifies the locking computer and the session number of the program owning the lock. SIDGP provides a straightforward method to identify session-monitor values: session/non-session mode, user ID, and group ID. M.CPU provides an indication when the multi-computer functions are enabled on a CPU. Refer to Chapter 4 for a detailed description of the library subroutines.

# **Software Requirements**

Datashare/1000 requires the RTE-6/VM Operating System, revision 2226 or later.

# **Hardware Requirements**

Datashare/1000 is compatible with any HP 1000 E or F Series computer system. The minimum hardware configuration for a multi-computer application is:

- 2 HP 1000 E/F Systems (with options required to support RTE-6/VM)
- 1 HP 79xxM/S Multi-Access Controller (MAC) disc and disc drive
- 1 IHP 13037 disc controller
- 1 HP 13178 multi-computer kit



# Chapter 2

## FMGR Commands

This chapter defines the actions of file manager commands extended for Datashare/1000. The information is intended to replace the corresponding command descriptions in the RTE-6/VM Terminal User's Reference Manual.

### AC (Allocate Cartridge)

Allocates a cartridge to the session user from the spare cartridge pool. Before the cartridge is mounted to the system and the caller's session, any files residing on the allocated cartridge will be purged. The AC command is valid only when operating under session control.

AC,crn,[p/g[,size[,id[,#dir tracks]]]]

- |                    |   |
|--------------------|---|
| <b>crn</b>         | Cartridge Reference Number to be assigned to the allocated cartridge (1 to 32767 or two ASCII characters). Must be a unique CRN to the session, but need not be unique to the system. This parameter is required.                   |
| <b>p/g</b>         | Private (p) or group (g) cartridge designation. (Cartridge is assigned to an individual user on the system, or to a functional group of users.) If this parameter is omitted, the default is to designate the cartridge as private. |
| <b>size</b>        | Number of tracks needed on the allocated cartridge. If this parameter is omitted, the default is to allocate the first available cartridge in the spare cartridge pool.   |
| <b>id</b>          | ASCII identifier assigned to the cartridge; up to six characters. If this parameter is omitted, id DC00xx is assigned, where xx is the LU of the terminal from which the command is input.  |
| <b>#dir tracks</b> | Number of directory tracks used by the file directory on the cartridge. If this parameter is omitted, one track is assumed.   |

## EXAMPLES:

- :AC,1000,G    The first available cartridge in the spare cartridge pool is cleared, assigned 1000 as its CRN and mounted to the caller as a group cartridge.
- :AC,DD,P    The first available cartridge in the spare cartridge pool is cleared, assigned DD as its CRN and mounted to the caller as a private cartridge.
- :AC,50,,75    Search the spare cartridge pool for a free cartridge with at least 75 tracks. The first one found is initialized by clearing its directory and assigning 50 as its CRN. By default, it is mounted as a private cartridge. If the cartridge has more than 75 tracks, the whole cartridge is made available.

## COMMENTS:

The AC command is a convenient way to mount cartridges to a session since, unlike the MC command, it is not necessary to know the LU number assignment for any disc cartridge.

The AC command will search the spare cartridge pool for a free cartridge (one that is not mounted to any other user or group on any computer) large enough to accommodate the "size" requirement, if specified. If a suitable cartridge is found, it is given the specified cartridge reference number. All files on the cartridge are purged, an entry is added to the system cartridge list, and the cartridge is mounted to the user's session by creating an entry in the session control block (SCB).

If size is not specified in the AC command, the first available cartridge in the spare cartridge pool is cleared and mounted.

In both a single-computer and multi-computer environment, the file directory will *always* start on the last track of the cartridge (defined at system generation). If an available cartridge is larger than the requested size, the entire cartridge is made available.

If the cartridge reference number specified is already mounted in the system cartridge list with the caller's private or group ID but is not currently active, the specified cartridge is activated; a new cartridge is not allocated. A cartridge can be designated as inactive using the DC (Dismount Cartridge) command; refer to the DC command description for details.

In the session environment, there are certain restrictions that apply when mounting a cartridge:

1. Only a specified number of private and group cartridges can be mounted at one time to a user session control block (SCB). The number is assigned by the system manager and put into the user's account file entry. An attempt to mount more than the specified number of cartridges will result in a FMGR 063 error, EXCEEDING SESSION DISC LIMIT.
2. There must be room in the user's session switch table (SST) to post the LU number of the cartridge being mounted. Further, there cannot be another session LU currently in the SST that has the same session LU as the cartridge being posted. These conditions can result in FMGR 066, NO ROOM IN SST, or FMGR 065, CONFLICT IN SST DEFINITION, errors.

## NOTE

If an account in one group is linked to an account in another group, all users in both groups must be careful not to use duplicate CRNs when allocating (AC) or mounting (MC) cartridges.

3. If a CRN is assigned to a cartridge mounted to the user session as a private cartridge, a group cartridge with the same CRN cannot be mounted to the session. An attempt to do so will cause a FMGR 012 error, DUPLICATE DISC LABEL OR LU. A user also cannot mount to the session a private or group cartridge with the same CRN as a system cartridge.

## CL (Cartridge List)

Displays the list of mounted cartridges. In a multi-computer environment, identifies both the computer and session to which the cartridge is mounted. No command parameters are required.

:CL        List all cartridges accessible on local computer.

:CLAL     List all cartridges in local computer system cartridge list.

### EXAMPLES:

```
:CL
LU  LAST TRACK  CR  LOCK  P/G/S
35      00202      JT  FMG58  P
31      00202    01000      G
02      00202    00002      S
10      00202    00050      S
```

```
:CLAL
LU  LAST TRACK  CR  LOCK  P/G/S  USER/GROUP
02      00202    00002  FMG85  S    MANAGER.SYS
10      00202    00050      S    MANAGER.SYS
32      00202    01000      G    ACCTG
39      00202    02000      G
31      00202    01000      G    MANUF
35      00202      JT  1.073  P    LEON.OL
33      00202    01000      G    QA
38      00202    00016      P    WONG.RD
      TURNBLL.TP
40      00202    05000      P    NAOMI.RD
```

## COMMENTS:

The cartridge list issued to the list device (the user terminal) contains the following information:

LU	Logical unit number of the cartridge.
LAST TRACK	Last track assigned to FMP on cartridge.
CR	Cartridge reference number.
LOCK	Blank if not locked. If locked by a program on this computer, the program name. If locked by a program on another computer in a multi-computer environment, "n.sss", where n is the computer number and sss is the session on the computer.
P/G/S	Indicates a cartridge mounted as private, group, or system. If blank, indicates a non-session cartridge.
USER/GROUP	User or group to whom cartridge is mounted. If blank, indicates a non-session cartridge.

The CL command lists only those cartridges mounted to the session or non-session user, the user's group, or the system. With the CLAL command, all cartridges mounted to all users of the system, including non-session users, are listed. (LU 39 in the CLAL call example is a non-session cartridge, since the P/G/S column is blank.) If the session monitor software modules are not included in the system, the CL and CLAL commands produce the same lists.

Some cartridges may be shared between session users by linking user accounts. (In the CLAL call example, LU 38 is shared by and, except for the system manager, accessible only to users WONG.RD and TURNBLL.TP.) When either of these users logs on, LU 38 will be mounted to the session as a private cartridge. For more details on account linking, refer to the RTE-6/VM System Manager's Manual.

Be aware that in a Datashare/1000 multi-computer configuration, cartridges mounted to an account on one computer are *not* automatically mounted to the same account on the other computers. The Mount Cartridge (MC) command can be used at each computer to mount a cartridge to those computers.

In the CLAL example, cartridge JT (LU 35) is locked by a program running under session 73 on computer 1 (1.073 entered in LOCK column).



## DC (Dismount Cartridge)

Logically removes a disc cartridge from a user's environment. In session mode, the inactive bit is set in the Session Control Block (SCB) entry for the cartridge. In non-session mode, the cartridge entry is deleted from the system cartridge list. Optionally (in session mode only), you can release the cartridge resource back to the system. In a multi-computer environment, DC returns an error if an attempt is made to dismount a downed cartridge.

DC,cartridge [,RR]

where

<b>cartridge</b>	is the cartridge identifier, a positive or alphanumeric CRN assigned to the cartridge or a negative LU associated with the cartridge.
<b>RR</b>	Release Resource. An optional parameter for session users only; this parameter is ignored in non-session mode. Specifying RR deletes the cartridge entry in the system cartridge list. If the cartridge originally came from the spare cartridge pool, it is returned.

### WARNING

If the cartridge being dismounted originally came from the spare cartridge pool, ensure that the cartridge does not contain any files that need to be saved before you return the resource to the pool using the RR parameter. If the cartridge is later mounted with the AC command or with the READT utility, all previous files on that cartridge will be lost.

If LU 2 is dismounted out of session, it is taken off the cartridge list and thus not available to session users. The System Manager must do a "DC,-2,RR" to remount it as a system cartridge.

## EXAMPLE:

In the following example, CL/CLAL are run in conjunction with the DC command to check the current status of the cartridges.

```
:CL
LU   LAST TRACK   CR   LOCK   P/G/S
35   00202        JT           P
31   00202        01000        G
02   00202        00002        S
10   00202        00050        S
```

:DC, JT            set inactive bit in cartridge entry in user's Session Control Block (SCB).

```
DISC CRN JT LU 35 INACTIVE
```

```
:CL
LU   LAST TRACK   CR   LOCK   P/G/S
31   00202        01000        G
02   00202        00002        S
10   00202        00050        S
```

Cartridge JT (LU 35) is no longer in the user's operating environment, but is still mounted to the user in the system cartridge list.

```
:CLAL
LU   LAST TRACK   CR   LOCK   P/G/S   USER/GROUP
02   00202        00002        S     MANAGER.SYS
10   00202        00050        S     MANAGER.SYS
32   00202        01000        G     ACCTG
31   00202        01000        G     MANUF
35   00202        JT           P     LEON.OL
33   00202        01000        G     QA
38   00202        00016        P     WONG.RD
```

Cartridge JT is still mounted to user LEON.OL, but has been set inactive by the DC,JT command.

:MC, 35            Resets inactive bit, mounts cartridge to user's operating environment.  
(Note that the MC Command requires that the cartridge be specified by its LU.)

```
:CL
LU   LAST TRACK   CR   LOCK   P/G/S
35   00202        JT           P
31   00202        01000        G
02   00202        00002        S
10   00202        00050        S
```

To return the cartridge to the system, the RR option (release resource) must be specified.

```
:DC, JT, RR
DISC CRN JT LU 35 DISMOUNTED FROM SYSTEM (POOL)
:CLAL
LU   LAST TRACK   CR   LOCK   P/G/S   USER/GROUP
02   00202        00002        S     MANAGER.SYS
10   00202        00050        S     MANAGER.SYS
32   00202        01000        G     ACCTG
31   00202        01000        G     MANUF
33   00202        01000        G     QA
38   00202        00016        P     WONG.RD
39   00202        02000
```

Cartridge 35 is no longer mounted to LEON.OL. It has been returned to the system and is now available to any user.

#### **COMMENTS:**

If an attempt is made to dismount a downed LU from the system, a FMGR-107 error (DISC ERROR; ONLY CARTRIDGE LIST UPDATED) will result. The LU is removed from the cartridge list, but the directory itself is not updated; it will continue to show the LU as mounted and not down. The LU must be returned to UP status before it can be dismounted.

When a session user (not the System Manager) dismounts a cartridge using the DC command, FMGR checks to see whether the specified cartridge is mounted as a private or group cartridge within the user's Session Control Block (SCB). If it is not, a FMGR 054 error (DISC NOT MOUNTED) results. Only the System Manager can dismount any cartridge in the system if the cartridge has a corresponding entry in the Session Switch Table (SST) for the manager's account.

If the session user does not specify the RR option in the DC command, the cartridge will not be returned to the system. An inactive bit is set in the cartridge entry in the user's SCB to logically remove it from the user's operating environment. The cartridge would then be omitted from any file search operation that occurs when a cartridge is not specified.

If the RR option is used, FMGR checks to see whether the cartridge specified is mounted as a private or group cartridge within the user's SCB. If the cartridge is mounted as P or G, FMGR removes its entry from the user's SCB and then checks to see whether the cartridge can be removed from the system cartridge directory. If one or more users have the cartridge mounted to a session, the cartridge is dismounted but not removed from the system cartridge list. If no user has it currently mounted, the cartridge is dismounted and its entry is removed from the system cartridge list. If a file is open and the user tries to dismount a cartridge, a FMGR-008 error (FILE OPEN OR LOCK REJECTED) is returned and the cartridge is not dismounted.

When a non-session user does a dismount cartridge operation using the DC command, FMGR checks the list of non-session cartridges for the specified cartridge to be dismounted. If the cartridge specified is not a non-session cartridge, a FMGR 054 error (DISC NOT MOUNTED) results. If it is a non-session cartridge, its entry in the system cartridge list is removed. Note that the FMGR 054 error also is returned if you attempt to dismount a cartridge mounted to another user or group.

LU 2 and LU 3 (if used) cannot be removed from the system cartridge directory. A command DC,2,RR will remove the current entry for LU 2, but it will also put a new entry for LU 2 at the bottom of the directory. This safeguards against dismounting system disc LU 2 or auxiliary disc LU 3. Note that when an entry for LU 2 or LU 3 is put back into the cartridge directory, the ID of the user issuing the DC command is used in the cartridge directory entry (i.e., System Manager or non-session user). This is how LU 2 or LU 3 can be made system type or non-session type cartridges.

## DL (Directory List)

Provides a list of all FMP files on a specified cartridge, a list of all FMP files on all cartridges within the user's operating environment or, optionally, a list of files with common namr characteristics. In a multi-computer environment, identifies the computer at which a program is open and indicates the exclusive, non-exclusive open status of the program.

DL [,cartridge [,master security]]

DL [,namr [,master security]]

where

<b>cartridge</b>	cartridge identifier: positive for CRN, negative for LU number. If omitted or zero, the directories of all cartridges available to the user are listed.
<b>master security</b>	code assigned to system at initialization. If correctly specified, the directory list includes the file security code and track and sector address for each file.
<b>namr</b>	file descriptor: must not be an LU number. Omitted subparameters default to zero. Dashes can be used as place holders in the namr to allow more flexibility.

### EXAMPLES:

Example 1.

```
:DL,2          List all FMP files on cartridge 2.

CR=00002
ILAB=SYSTEM NXTR= 00101 NXSEC=40 #SEC/TR=096 LAST TR=00255 #DR TR=01

NAME    TYPE    SIZE/LU    OPEN TO
+@CCT!  00001  00057 BLKS  LOGON LGOFF
WELCOM  00004  00001 BLKS
**WELCO 00004  00002 BLKS
**DEV   00004  00002 BLKS    1 .-
.
.
.
**LCHEL 00004  00003*BLKS    DEMO -
.
.
**HELLO 00004  00003 BLKS
```

### Example 2.

```
:dl,45,XX    List all FMP files on cartridge 45, master security code XX

CR= 00045
ILAB=PROJ  NXTR= 00084 NXSEC=072 #SEC/TR=128 LAST TR=00280 #DR TR=01

NAME      TYPE      SIZE/LU      SCODE TRACK SEC  OPEN TO
MICRO     00004 00012 BLKS   00000 00000 000    1.
&HDR     00004 00002 BLKS        SM 00000 024
LGATAT    00003 00330 BLKS        KK 00000 028
COMPL     00004 00021 BLKS   00000 00005 048    0.  1.
.
.
.
$SPEC     00005 00023 BLKS        PC 00005 090
"LDREC    00004 00031 BLKS   00000 00006 008
.
.
.
PASN6V    00003 00024 BLKS  -31107 00032 004
PASNXL    00003 00026 BLKS   00000 00032 052

:DL,A                      List all files whose name is A.
:DL,A-----              List all files whose name starts with A.
:DL,--A--A:-5:2          List all files whose third and sixth name characters are A and
                           whose security code is -5 or +5 and which are on cartridge 2.

:DL,-----:::1          List all files of length 1.
:DL,-----:::16        List all files with record length 16.
```

### COMMENTS:

The DL,namr formats shown above allow more flexibility when specifying directory entries to be listed. When these formats are used, the following conditions must be met before a given file entry will be listed:

1. The file name must match the name portion of <namr>, except that any dashes in <namr> will "match" any character.
2. Zero as a subparameter matches any actual subparameter. If a non-zero subparameter is specified, it must match the file's actual parameter.
3. The standard security code match is used; i.e., -n matches either +n or -n, but +n matches only +n.

The directory list is provided in two formats: a short list and a long list. Both lists have the same header information describing the cartridge itself; they differ in the file information provided. The long list (example 2) includes a file security code for each file and the track and sector address for the file. To obtain the long list, you must correctly enter the system master security code in the command runstring.

For session users, only the directories of those cartridges mounted to the user (P), the user's group (G), or the system (S) are listed. For non-session users, only the directories of non-session cartridges and system cartridges are listed.

The asterisk preceding the word BLKS in the directory listing (file "LCHEL in example 1) is printed if the file size is in multiples of 128 blocks. In the example, the file size for "LCHEL is three 128-block multiples.

The OPEN TO column contains an entry if the file is open. If the file is open in shared mode, up to seven programs may have the file open. For programs on one computer, the program name will be printed (file +@CCT! in example 1 is shared by programs LOGON and LGOFF on this computer).

In a Datashare/1000 multi-computer system, open flags for programs on other computers will cause the computer number to be printed. File MICRO in example 2 has been opened non-exclusively by a program on computer 1. If a file is exclusively opened, a minus sign will be appended to the program name or computer number. File "DEV in example 1 has been opened exclusively by a program on computer 1, as shown by the 1.- entry in the OPEN TO columns.

## IN (Initialize Cartridge)

Except for the system cartridges of a new system, the initialize command cannot be applied to a cartridge without a directory. When the IN command is used on uninitialized LU 2 or LU 3, or when initialization causes files to be purged, IN will create a standard specification entry in a uni-computer system or an expanded specification entry if the Datashare/1000 multi-computer features are enabled. (Refer to Appendix A for details of the cartridge specification entry format.)

In a multi-computer system, the unsharable flag (SY field, word 0) is set in the cartridge specification extension for LU 2 and LU 3 to prevent other computers from mounting these cartridges.

When used to alter an existing cartridge directory, IN preserves the multi-computer mount flag in the cartridge specification entry extension. However, IN will not change the cartridge reference number field in the directory if the cartridge is mounted to more than one computer. An attempt to do so will result in a FMGR-051 error, CANNOT CHANGE CRN ON MULTIPLY-MOUNTED CARTRIDGE.

## MC (Mount Cartridge)

Makes an unmounted cartridge available to a user. When used in a multi-computer environment, MC sets a flag in the cartridge specification entry to prevent a cartridge from being mounted by a user on another computer in the system.

MC,lu [,p/g [,size [,id [,#dir tracks [,label]]]]]

where

- |             |   |
|-------------|---|
| <b>lu</b>   | logical unit number of cartridge to be mounted; can be positive or negative. If operating under session control, cartridge must first be in user's session switch table (SST).  |
| <b>p/g</b>  | Private, group, or non-session cartridge designation. When operating under session control, enter P for private cartridge or G for group cartridge; the default is to private. When operating non-session, this parameter is meaningless, but a comma <i>must</i> be entered as a placeholder if other optional parameters are specified. |
| <b>size</b> | The number of tracks to be used on the cartridge. The first track is always 0 and the last track is equal to cartridge size-1.  |

### NOTE

The following optional parameters are applicable only if there is not a valid directory on the first directory track. If a valid directory is present, these parameters are ignored if specified.

- |                    |  |
|--------------------|--|
| <b>id</b>          | ASCII identifier assigned to the cartridge, up to six ASCII characters. When defaulted, the id is DC00xx, where xx is the LU number of the terminal from which the MC command is entered.  |
| <b>#dir tracks</b> | Number of directory tracks used by the file directory on the cartridge. The default is one track.  |
| <b>label</b>       | CRN to be assigned to the cartridge being mounted. Applies only to cartridges that do not have a valid directory at the specified track. If the cartridge has a CRN associated with it, this parameter is ignored (to change the CRN of an LU, refer to the IN command description). |

## EXAMPLES:

:MC,-39,G	Operating under session, mount LU 39 as a group cartridge.
:MC,40	Operating non-session, mount LU 40.
:MC,-41,,202,DATA,2,1250	Operating non-session, mount LU 41, with 202 tracks, identify as "DATA", reserve 2 directory tracks, assign CRN #1250. Cartridge does not have a valid directory on track 201. Note comma used as a placeholder for the p/g parameter.

## COMMENTS:

The MC command will initialize the cartridge only if there is not a valid directory on the first directory track. This depends on the size parameter (if specified). For example, for a cartridge (LU 41) that is defined in the track map table to have 203 tracks, an MC,-41 would require a valid directory on track 202. An MC,-41,,100 would require a valid directory on track 99. If the cartridge has a valid directory, the id, #dir tracks, and label parameters are ignored.

If the cartridge does not have a valid directory, MC will attempt to initialize the cartridge. The label parameter must be specified for the cartridge to be mounted and initialized; if it is not, an error is issued and MC terminates. The other parameters can be defaulted.

### CAUTION

In a multi-computer system the size and label parameters, if not carefully specified, could result in a cartridge being mounted differently to two separate computers. That is, if cartridge LU 41 is mounted by one computer as above (with a valid directory on track 202), and an MC command of the form MC,-41,JT,100 is issued from another computer in the system, MC will only check the specified last track; it will not check for the directory at track 202 and will not find a valid directory at track 99. In this case, since the label was specified in the command call, MC will initialize the cartridge directory on track 99 and mount LU 41 to the second computer as CRN JT. This could result in the destruction of data as the cartridge is accessed by the two separate computers.

If MC is used to mount a cartridge with a single-computer cartridge specification entry (non-extended entry) on a multi-computer system, and the cartridge is not presently mounted on any computer, it is mounted and the MC field in the cartridge specification entry is set to prevent the cartridge from being mounted by any other computer.

Once mounted, the files on the cartridge may be used exclusively by the mounting computer. The directory conversion utility (DCONV) also can be used to rebuild the directory in the expanded entry format, which will allow the cartridge to be simultaneously mounted by multiple computers. (Refer to Chapter 3 for a description of DCONV.)



If a single-computer cartridge specification entry exists on the cartridge and the cartridge is presently mounted on some other computer, the mount request will result in a FMGR-034 error, DISC ALREADY MOUNTED. In this case, either dismount the cartridge from the other computer or run DCONV from the computer that has mounted the cartridge. DCONV will rebuild the directory and thus allow multiple mounts.

If a single-computer cartridge specification entry exists on the cartridge in a multi-computer environment, and the cartridge is not mounted, DCONV can be run from any computer in the system to rebuild the directory for multiple mounts.

If a cartridge has been dismounted by all computers in a system, the first computer to mount it with MC will clear any open flags that exist on the cartridge. When a mounted cartridge is mounted by other computers in the system, only those open flags that belonged to programs on the mounting computer will be cleared.

### **Session Environment Restrictions**

In the session environment, there are certain restrictions that apply when mounting a cartridge.

1. Each user may only have a specified number of private and group cartridge mounted to the user session control block (SCB) at one time. The number is assigned by the system manager and put into each user account file entry. If an attempt is made to mount more than the specified number of cartridges, a FMGR 063 error, EXCEEDING SESSION DISC LIMIT, will occur.
2. There must be sufficient room in the session switch table (SST) to post the LU number of the cartridge being mounted. Also, there cannot be another session LU currently in the SST that has the same LU as the cartridge being posted. These conditions can cause FMGR 066 error, NO ROOM IN SST, or FMGR 065, CONFLICT IN SST DEFINITION.
3. If a user has assigned a CRN to a private cartridge mounted to the session, a group cartridge that has the same CRN assignment cannot be mounted to the session. An attempt to do so will result in a FMGR 012 error, DUPLICATE DISC LABEL OR LU. A cartridge with the same CRN as a system cartridge also may not be mounted to a session as a group or private cartridge. The FMGR 012 error also will occur if an attempt is made to mount an already mounted cartridge in either a single- or multi-computer environment.

If an account in one group is linked to an account in another group, all users in both groups must be careful not to duplicate CRNs when allocating (AC) or mounting (MC) cartridges.

## **RP (Restore Program) and RU (Run Program)**

Extensions to the RP and RU commands are transparent; however, the following should be noted in using these commands in a multi-computer environment.

In a uni-computer system, ID segments may contain pointers directly to program files (type 6) on any cartridge. Because of the need to check for ID segment pointers by the purge command, ID segment pointers cannot point to shared cartridges in a multi-computer configuration.

Since LU 2 and LU 3 cannot be shared, ID segments may point to program files on these cartridges; for all other cartridges, the program file will be copied onto system tracks and the ID segment will be constructed to point to this copy.

A problem can occur with programs that use T5IDM to dynamically restore segments. When a program is restored from a cartridge other than LU 2 or LU 3 in a multi-computer system, it is copied onto system tracks on LU 2 or LU 3. After the copy operation, the system will think that the program was restored from LU 2 or LU 3. When T5IDM is scheduled to restore a segment, it only searches the cartridge that contains the program tracks of the main program (i.e. LU 2 or LU 3, not the original cartridge). Thus, T5IDM may not find the segment, or may find a segment of the same name that belongs to another program. Non-segmented programs can be safely stored on any cartridge.

This problem can be avoided by storing any segmented programs that use T5IDM on LU 2 or LU 3, using the FMGR SP command. A better solution would be to size LU 2 and LU 3 as large as possible at system generation so that type 6 files can be stored there initially, thus avoiding the delays incurred by copying from disc to system tracks.

# Chapter 3

## Utilities

This chapter describes the utilities DMALL and DCONV, provided for use with Datashare/1000. DMALL updates each cartridge directory after the initial bootup of a switched system to clear the mount bits for any cartridges that were mounted on the pre-switched system. DCONV converts the existing cartridge specification entry in the file directory to the extended format required for Datashare/1000 multi-computer use.

Note that in systems that include a tape drive, the disc directory conversion also can be accomplished by using the RTE-6/VM utility set WRITT/READT to first save the cartridge to tape and then restore it to disc. If the multi-computer features have been enabled, READT will automatically convert the cartridge specification entry to the expanded Datashare/1000 format as part of the restoration process to disc. (Refer to the RTE-6/VM Utility Programs Reference Manual for a description of the WRITT/READT utilities.)

### Directory Conversion Utility DCONV

The directory conversion utility DCONV provides a convenient, one-step method for converting existing cartridge specification entries to the extended 32-word entry required for cartridges used in a multi-computer environment. The multi-computer functions must be enabled before DCONV can be used.

### Running DCONV

Call DCONV with the runstring

```
:RU,DCONV,crn [:track]{,crn [:track] . . .,crn [:track]}
```

where

- crn** is either a positive CRN or a negative LU number. (The user must have write access to the cartridge specified.)
- track** is the cartridge size. This parameter is valid only when the cartridge is specified as a negative LU, AND the cartridge is not mounted, AND the directory is not on the last track of the cartridge. The default is track = last directory track + 1).

Multiple cartridges can be specified in the runstring, up to a maximum of 80 characters. If the crn parameter specifies an unmounted negative LU, the cartridge is mounted and the track parameter is used to locate the directory. The cartridge specification entry is converted and the cartridge then dismounted. If the crn parameter is specified in the form +crn, and it does not correspond to a mounted cartridge LU, DCONV returns an error and exits.

If the crn is already mounted and the directory is full, DCONV will attempt to add a track to the directory to create the extended cartridge specification entry. If the last file track is in use, DCONV will report the unsuccessful attempt with the following message and then exit; the cartridge specification entry will not be changed:

**DCONV: nn NOT ENOUGH SPACE**

where nn is the -LU or +CRN of the cartridge. If this error occurs, packing the cartridge (FMGR PK command) may reclaim sufficient space to allow expansion of the directory on the last file track. Another method is to use the FMGR copy command (CO) to copy the cartridge onto a larger cartridge. The original cartridge then can be cleared, converted, and reused.

After each directory conversion, DCONV issues the message

**DCONV: xx SUCCESSFULLY CONVERTED**

where xx identifies the cartridge whose directory was successfully converted.

## **Error Messages**

DCONV can generate any of the following error messages, where xx is the -LU or +CRN of the cartridge at which the error was encountered. In all cases the named cartridge LU directory is not converted; DCONV must be rerun.

**DCONV: xx DISC ERROR**

**DCONV: xx INTERNAL BUFFER TOO SMALL**

The buffer declared in the RTE library (\$UTLIB) is too small for DCONV. Consult your local HP representative.

**DCONV: xx NO POOL TRACKS**

The system tracks may be in use by another program, or insufficient tracks were specified. Wait until the system tracks are released, or change the number of tracks available. Consult the System Manager.

**DCONV: xx LOCKED**

**DCONV: xx NOT MOUNTED**

**DCONV: xx ERROR FMGR yy**

The listed FMGR error has occurred. When the FMGR prompt (:) appears, enter HE to display the full error message definition.

# Dismount Cartridge Utility DMALL

Because system cartridge LU 2 (and auxiliary cartridge LU 3, if used) cannot be shared in a multi-computer environment, each computer in the system has a unique unsharable cartridge list. As a result, cartridge mount/dismount and lock/unlock actions taken by one computer are not posted to the cartridge lists of other computers in the multi-computer group. This information is placed only in the cartridge specification entry and extension of each cartridge.

When a system is switched, SWTCH clears the system cartridge list (with the exception of LU 2), but cannot clear the mount bits on each cartridge. Therefore, the new system cartridge list will indicate that only LU 2 is mounted, while the individual cartridge directories will contain the mount status of the cartridge in the pre-switched system. The cartridge list and the individual cartridge directories also will contain inconsistent information when LU 2 is physically restored. In this case, the cartridge list will reflect the status of the backed-up system, and the cartridge directories will show the current mount states.

The utility DMALL is provided to place the cartridge list and cartridge directories in a consistent state. DMALL will clear the cartridge list with the exception of LU 2, and will clear any mount bits set in the individual cartridge directories. The switched (or restored) system cartridge list and each directory list then will consistently indicate that only LU 2 is mounted. If LU 3 also is included in the cartridge list, it is not cleared; the status in this case will indicate that LU 2 AND LU 3 are mounted.

DMALL must be run immediately after the first boot of the switched or restored system - THERE CANNOT BE ANY OTHER ACTIVITY ON THE SYSTEM WHILE DMALL IS RUNNING. The utility must be run in non-session mode to assure that DMALL has access to all cartridges since, in session mode, it would be restricted to only those cartridges accessible to the session.

## Running DMALL

Call DMALL with the runstring

```
RU,DMALL [,cpu]
```

The default for the cpu parameter is to the number of the switched system as defined by the \$CPU# entered in the RP section of the system generation. This parameter is not required if the pre-switched and switched computers have the same number. (Note that this is the recommended practice.) If, however, the computer numbers of the pre-switched and switched systems are different, the computer number of the *PRE-SWITCHED* system must be given in the runstring.

DMALL checks the mount/dismount status contained in the cartridge specification entry and, if the entry indicates that the cartridge was mounted in the pre-switched system (the mount flag is set), updates the entry to dismount the cartridge.

## Error Messages

DMALL can generate the following error messages during execution. If the error is defined as fatal, the condition encountered is such that no cartridge directories could be updated. Non-fatal errors allow DMALL to continue updating; only the cartridge at which the error was encountered could not be updated. In general, conditions encountered by DMALL are errors that are external to the utility. The stated error condition should be remedied and DMALL rerun in all cases.

### **DMALL 01:**

**DMALL must be run non-session**

(Fatal) If DMALL is run in a session environment, it is limited by the user's session switch table (SST) and thus does not have access to all cartridges for updating the directory.

### **DMALL 02:**

**Computer number must be an integer between 0 and 7, inclusive**

(Fatal) A maximum of four computers may function in the multi-computer environment. The numbers must be within the range of 0 and 7, and are assigned at system generation. Rerun DMALL, specifying a computer number within the allowed range.

### **DMALL 03:**

**Disc error on LU xx; DISC NOT UPDATED**

(Non-fatal) An error was encountered when trying to access the named cartridge LU directory. The directory for that cartridge is not updated.

### **DMALL 04:**

**Resource number not allocated; NO DISCS UPDATED**

(Fatal) DMALL encountered an error in trying to allocate a resource number.

### **DMALL 05:**

**Resource number deallocate error**

(Non-fatal) DMALL encountered an error when trying to deallocate the resource number. Note that this does *not* mean that the directories could not be updated.

### **DMALL 06:**

**Disc controller lock failed; LU xx NOT UPDATED**

(Non-fatal) DMALL could not access the controller lock when trying to update the named cartridge LU.

**DMALL 07:**  
**Disc controller unlock failed**

(Non-fatal) The controller could not be unlocked after the cartridge directory updates.

**DMALL 08:**  
**Resource number lock error; LU xx NOT UPDATED**

(Non-fatal) DMALL could not lock the resource number. The named cartridge LU directory could not be updated.

**DMALL 09:**  
**EQT lock error; LU xx NOT UPDATED**

(Non-fatal) DMALL could not lock the EQT. The named cartridge LU directory could not be updated.

**DMALL 10:**  
**EQT unlock error**

(Non-fatal) DMALL could not unlock the EQT after the cartridge directory update.

**DMALL 11:**  
**This is a uni-computer system; no updates necessary**

(Fatal) User attempted to run DMALL in a single-computer system. The directory update is not required in this environment.

**DMALL 12:**  
**Cartridge List Not Cleared; NO DISCS UPDATED**

(Fatal) Internal error. See the System Manager.





# Chapter 4

## FMP Library Subroutines

This chapter describes the FMP library subroutine FSTAT as extended for use in the Datashare/1000 multi-computer environment. Two subroutines, SIDGP and M.CPU, have been added to the library for Datashare/1000 and are also described here. SIDGP provides access to commonly needed session monitor values, and M.CPU gives an indication of the multi-computer enable status.

### FSTAT

FMP routine FSTAT returns the cartridge directory to a user buffer. Additional parameters have been added to the FSTAT call to specify the desired format and the size of the buffer being supplied. The caller may also specify if all cartridges, or just private, group, and system cartridges, are to be reported.

### FSTAT Calling Sequence

Call FSTAT with the sequence

```
CALL FSTAT (ISTAT,ILEN,IFORM,IOP,IADD,MC)
```

In the calling sequence, the underlined parameters are optional. If, however, selected parameters are used within the optional parameter group, their positions must be maintained with commas as placeholders. As an example, if you wish to specify the IFORM and MC parameters only, the call sequence must be of the form

```
CALL FSTAT (ISTAT,,IFORM,,,MC)
```

The FSTAT parameters are

**ISTAT** is the buffer into which the directory will be read.

**ILEN** is the length of the user buffer. Default is 125 words.

**IFORM** is an optional parameter that selects the format of the cartridge list to be written into the ISTAT buffer:

If omitted or "0", format 1 is used.

If non-zero, the directory is written into the buffer in format 2 or 3:

If MC is omitted or "0", format 2 (a copy of the actual cartridge list) is returned.

If MC is "1", format 3 is returned. This format includes multi-computer cartridge lock information.

**IOP** is an optional parameter that selects cartridges whose information is returned in ISTAT.

If omitted or "0" under session control, the only returns are those private and group cartridges mounted to the session, followed by system cartridges.

If "1" under session control, all cartridges mounted on the system are returned in the order they appear in the cartridge list.

If "2" under session control, all cartridges available to the session are returned in the order they would be searched by D.RTR.

If not under session control, this parameter has no meaning. System and non-session cartridges are reported in the order they appear in the cartridge list.

**IADD** is set nonzero if not all of the cartridge list could be returned in ISTAT.

**MC** is the parameter used in a multi-computer environment to select format 3 for the information reported in ISTAT. This parameter is only meaningful when IFORM is non-zero.

If "0" or omitted, IFORM selects either format 1 or 2.

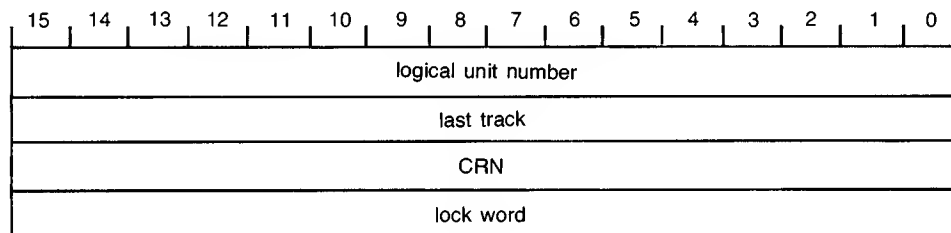
If "1" (*and* IFORM is non-zero), selects format 3. Note that format 3 is identical to format 2 when used in a single-computer environment.

## ISTAT Return Formats

A four-word entry is reported in ISTAT for each cartridge. Indexed from 1 (FORTRAN default), ISTAT(1-4) describes the first cartridge, ISTAT(5-8) describes the second, etc.

### Format 1

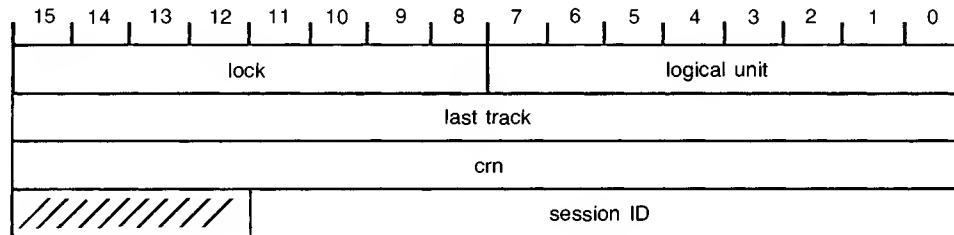
Format 1 only reports locks made by *local* programs. Cartridges can be reported as not locked when they actually may be locked by programs on other computers.



lock word = "0" if not locked by program on local computer, or  
= ID segment address of local locking program

## Format 2

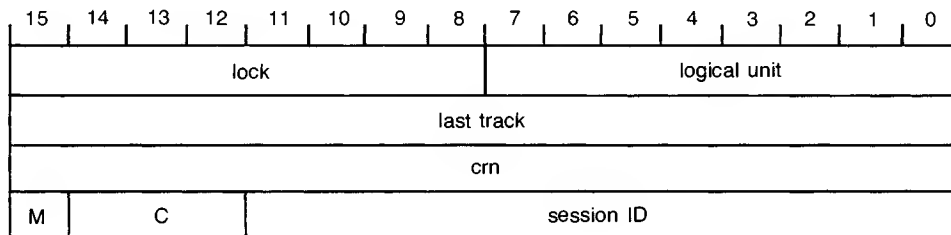
Format 2 only reports locks made by *local* programs; cartridges can be reported as not locked when they actually may be locked by programs on other computers.



lock word = "0" if not locked locally, or  
= keyword index for ID segment of local locking program.

## Format 3

Format 3 is used in a multi-computer environment to report the lock status of a cartridge. When a cartridge is locked by a different cpu, this format identifies the computer number and the ID of the session that owns the lock.



M = "0" All fields match the format 2 definitions. This mode is used for unlocked cartridges, or cartridges locked by local programs. C (computer number) is zero.

M = "1" The lock word describes a lock made by a program on another computer. In this case C is the computer number and session ID is the terminal LU number of the session running the program that owns the lock.

## SIDGP

This subroutine simplifies access to commonly needed session monitor values: session/non-session mode, user ID, and group ID. The calling sequence for SIDGP is:

CALL SIDGP(SESSN,USER,GROUP)

**SESSN** returns “-1” (true) if in session mode, or “0” (false) if not in session mode.  
**USER** in session mode, returns user ID, else returns “0”.  
**GROUP** in session mode, returns group ID, else returns octal 7777.

## M.CPU

This subroutine indicates whether or not multi-computer features are enabled on a computer. The calling sequence for M.CPU is:

MC = M.CPU(IDUM)

MC = “-1” (true) if multi-computer functions enabled;  
“0” (false) if not enabled, or if force-loaded systems other than RTE-6/VM.

# Chapter 5

## Software Installation

This chapter provides instructions for installing Datashare/1000 in an RTE-6/VM system (revision 2226 or later). In summary, Datashare/1000 provides all of the capabilities of the file manager (FMGR) in a multi-computer application. Datashare/1000 is transparent in use; all commands accepted by the RTE-6/VM FMGR are accepted by the multi-computer file manager. When used in a single-computer environment, Datashare/1000 is identical to the RTE-6/VM file manager package.

### System Generation

To enable the multi-computer functions, include a

`$CPU#,RP,cpu no.`

statement in the 'CHANGE ENTS?' section of the system generation. The number entered must be a unique integer value within the range of 0 and 7. To avoid any chance of confusion, it is recommended that this number be the same as that of the pre-switched system.

At system generation, relocate the following modules:

<code>REL,%BMPG1</code>	<code>*Multi-computer FMGR</code>
<code>REL,%BMPG2</code>	<code>*Multi-computer Directory Manager</code>
<code>REL,%BMPG3</code>	<code>*Multi-computer File Management Package (FMP)</code>
<code>REL,%DMALL</code>	<code>*Cartridge Status-Update Utility DMALL</code>
<code>REL,\$DSHAR</code>	<code>*Datashare Library</code>

Note that the multi-computer File Manager modules replace the File Manager modules provided with the RTE-6/VM software package.

If Datasafe/1000 is to be generated in with the Datashare/1000 system, \$RECAP (part no. 91745-12001), the RECAP library in Datasafe/1000, should be relocated in place of \$DSHAR.

The following modules may be generated in, or may be loaded on-line with LOADR:

<code>%DCONV</code>	<code>*Cartridge Specification Entry Expansion Utility</code>
<code>%READT</code>	<code>*Restore Cartridge Utility READT</code>

The %READT utility module need be loaded/generated only if you intend to perform the disc directory conversion using the RTE-6/VM magnetic tape save and restore utilities.

## User Accounts

In a multi-computer environment, user account assignments must be created in the same order on all computers. This can be accomplished at system generation by using the same ACCTS answer file (but not the same ACCTS output file) at each computer. Refer to the RTE-6/VM System Manager's Reference Manual for details of the ACCTS file.

## Cartridge Status Update

Immediately after the initial boot of the newly switched system, run DMALL to update the status of the cartridge directories to dismount any cartridges that had been mounted to the pre-switched system. (Refer to Chapter 3 for details of the utility DMALL.)

There must not be any other activity on the computer when DMALL is running. In order to gain access to all cartridges, DMALL must be run in a non-session environment.

Call DMALL with the runstring

`RU,DMALL[,cpu]`

where `cpu` is the pre-switched computer number. Since the default is to the switched system computer number, this parameter is not required if the pre-switched and switched computer numbers are the same. It is strongly recommended that you use the same number for both the pre-switched and switched computers.

## Software Modules

The following modules constitute the Datashare/1000 software;

Module	Part No.	
%BMPG1	91747-12001	Multi-computer FMGR
%BMPG2	91747-12002	Multi-computer Directory Manager
%BMPG3	91747-12003	Multi-computer FMP
%DMALL	91747-16002	DMALL Utility
%DCONV	91747-16001	DCONV Utility
#DCONV	91747-17001	DCONV Loader
\$DSHAR	91747-12004	Datashare Library





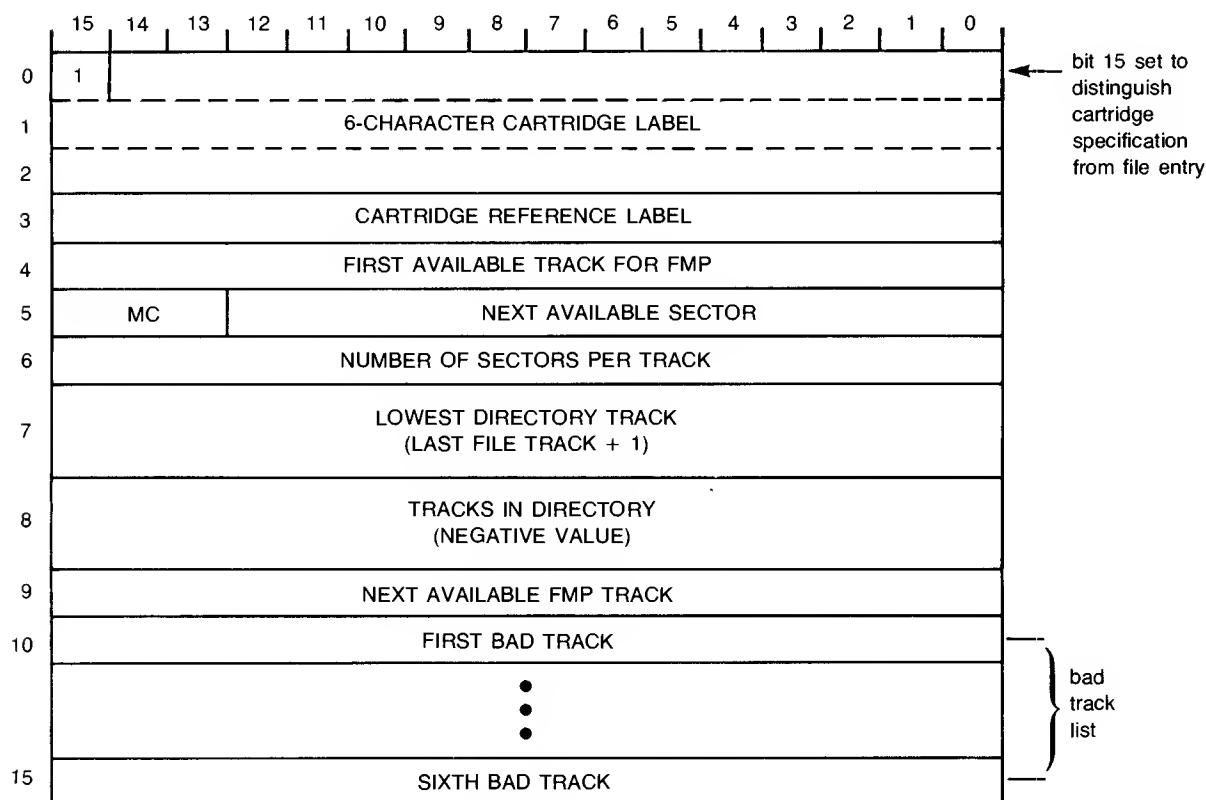
# Appendix A

## Cartridge Specification Entry Format

The File Directory starts in sector 0 of the last track on all cartridge LUs. The first entry in each File Directory is the specification entry for the cartridge itself. For Datashare/1000, the cartridge specification entry has been expanded with a 16-word extension.

### Cartridge Specification Entry

The first entry is identical to earlier formats, except that the MC field (bits 15-12 of word 5) is used to identify the mount/dismount status of a cartridge not in the expanded Datashare/1000 format. This prevents simultaneous mounting of the cartridge by more than one user. When the cartridge is dismounted, this field is "0"; when the cartridge is mounted, bit 15 is set to "1" and bits 14-12 contain the number of the computer that has mounted the cartridge. The format of the entry is:



## Cartridge Specification Extension

The MOUNT BITS field in word 0 of the cartridge specification extension identifies those computers that have currently mounted the cartridge. The high-order bit corresponds to computer 3 and the low-order bit to computer 0 (a bit value of "1" indicates mounted). When the cartridge is dismounted, the bit for the dismounted cartridge is set to "0".

The SY field in word 0 is used to mark unsharable cartridges (SY=1 for unsharable, SY=0 for sharable). This field is always set to "1" for the system and auxiliary cartridge (LU 2 and LU 3), which can never be shared.

The SESSION ID field in word 2 is a copy of the same field from the cartridge list, and is meaningless when the cartridge is dismounted. When the cartridge is first mounted, the appropriate session identification is placed in this field. The session ID is used to prevent illegal mounting of the cartridge by a different user/group.

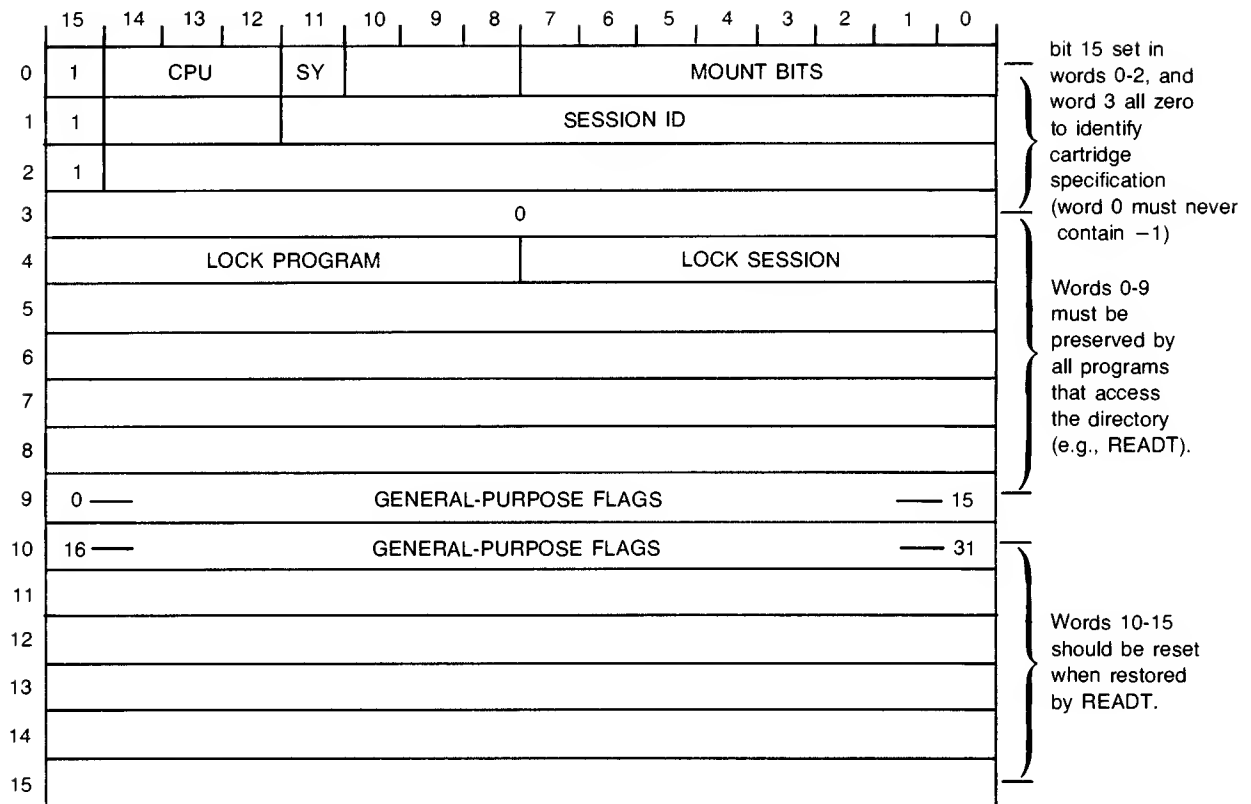
Word 4 indicates the lock status of the cartridge (0 = unlocked). If locked, the LOCK PROGRAM field duplicates the lock information from the cartridge list, and the LOCK SESSION field contains the session number. The computer running the locking program is identified in the CPU field of word 0.

The general-purpose flags in words 9 and 10 are reserved as follows:

0-7,  
24-31 Customer use

8-15,  
16-23 HP products

The format of the extended entry is:





# Index

## A

AC command, 2-1  
    duplicate label, LU assignment, 2-3  
    examples, 2-1  
    LU number conflict, 2-3  
    restrictions, session, 2-2  
    runstring, 2-1  
Allocate Cartridge command AC, 2-1

## C

calling FSTAT, 4-1  
cartridge directory return routine FSTAT, 4-1  
cartridge dismount, 2-5  
cartridge file directory track, 2-2  
Cartridge list command CL, 2-3  
cartridge specification entry format, A-1  
CAUTION, MC command, 2-12  
cartridge status update, 5-2  
CL command, 2-3  
    default destination, 2-4  
    examples, 2-3  
    shared disc log entries, 2-4  
controller lock limitation, 1-1

## D

D.RTR use of controller lock feature, 1-2  
DC command, 2-5  
    changing LU 2/LU 3 types (session/non-session), 2-7  
    disc-not-mounted error, 2-7  
    dismounting LU 2, 2-7  
    examples, 2-6  
    non-session use, 2-7  
    restore resources, 2-5  
    usage sequences, 2-6  
    warning, returning LU to spare pool, 2-5  
DCONV, 3-1  
    disc-full error recovery, 3-2  
    error messages, 3-2  
directory conversion utility DCONV, 3-1  
directory list command DL, 2-8  
dismount cartridge command DC, 2-5  
dismount cartridge utility DMALL, 3-3  
DL command, 2-8  
    long list format, 2-10  
    master security code log format, 2-9  
    namr customizing, 2-9  
    runstring, 2-8  
    short list format, 2-9  
DMALL, 3-3  
    error messages, 3-4  
    runstring, 3-3

## E

enabling multi-computer features, 1-1, 5-1  
error messages  
    DCONV, 3-2  
    DMALL, 3-4  
errors, DC command, 2-7  
extended cartridge specification entry format, A-2

## F

FMGR commands modified, 1-2  
FMP library subroutines, 4-1  
FSTAT  
    ISTAT returns, 4-2  
    library routine, 4-1  
functional configuration, 1-1

## G

generation  
    system, 5-1  
    user accounts, 5-2

## H

hardware requirements, 1-3

## I

IN command, 2-10  
    creating expanded LU specification entry, 2-10  
    use with shared cartridges, 2-10  
Initialize cartridge command IN, 2-10  
ISTAT returns  
    format 1, 4-2  
    format 2, 4-3  
    format 3, 4-3

## L

library subroutines, 1-2

## M

- M.CPU library routine, 4-4
- master accounts file, 1-1
- MC command, 2-11
  - clearing open flags, 2-13
  - examples, 2-12
  - mounting cartridges, multi-computer, 2-12
  - runstring, 2-11
  - session environment restrictions, 2-13
  - use of size parameter, 2-12
- modified FMGR commands, 1-2
- Mount Cartridge command MC, 2-11
- mounting duplicate cartridges, 2-13
- multi-computer
  - enable, 1-1, 5-1
  - LU specification entry creation, IN command, 2-10
  - status routine M.CPU, 4-4

## R

- relocatable modules, 5-1
- Restore Program command RP, 2-13
- restoring segmented programs with T5IDM, 2-14
- RP command, 2-13
- RU command, 2-13
- Run Program command RU, 2-13
- runstring
  - AC, 2-1
  - DC, 2-5
  - DCONV, 3-1
  - DL, 2-8
  - DMALL, 3-3
  - MC, 2-11

## S

- segmented program restoration, T5IDM, 2-14
- Session ID routine SIDGP, 4-4
- SIDGP library routine, 4-4
- size parameter use precaution, MC command, 2-12
- software installation, 5-1
- software modules, 5-3
- specifying sharing CPUs, 1-1

## T

- T5IDM use restrictions, segmented programs, 2-14

## U

- user, account ID limitations, 1-1, 5-2
- using WRITT/READT in converting directory, 3-1
- utilities provided, 1-2
- utility
  - DCONV, 3-1
  - DMALL, 3-3

## W

- WARNING DC command, 2-5
- WRITT/READT use in converting directory, 3-1

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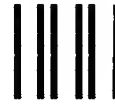
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Tel: 68172  
Telex: 31146 BERSAL SO  
Cable: BERSAL-SURABAYA  
A\*,E,M,P

## IRAQ

Hewlett-Packard Trading S.A.  
Mansoor City 9B/3/7  
BAGHDAD  
Tel: 551-49-73  
Telex: 2455 HEPAIRAO IK  
CP

## IRELAND

Hewlett-Packard Ireland Ltd.  
Kestrel House  
Clanwilliam Court  
Lower Mount Street  
DUBLIN 2, Eire  
Tel: 680424, 680426  
Telex: 30439  
A,C,M,C,E,M,P  
Cardiac Services Ltd.  
Kilmore Road  
Arane  
DUBLIN 5, Eire  
Tel: (01) 351820  
Telex: 30439  
M

# SALES & SUPPORT OFFICES

Arranged alphabetically by country



## ISRAEL

**Electronics Engineering Division**  
**Motorola Israel Ltd.**  
 16 Kremenetski Street  
 P.O. Box 25016  
 TEL-AVIV 67899  
 Tel: 338973  
 Telex: 33569 Motil IL  
 Cable: BASTEL Tel-Aviv  
 A,CM,C,E,M,P

## ITALY

Hewlett-Packard Italiana S.p.A.  
 Traversa 99C  
 Giulio Petrone, 19  
 I-70124 BARI  
 Tel: (080) 41-07-44  
 M

Hewlett-Packard Italiana S.p.A.  
 Via Martin Luther King, 38/111  
 I-40132 BOLOGNA  
 Tel: (051) 402394  
 Telex: 511630  
 CM,CS,E,MS

Hewlett-Packard Italiana S.p.A.  
 Via Principe Nicola 43G/C  
 I-95126 CATANIA  
 Tel: (095) 37-10-87  
 Telex: 970291  
 C,P

Hewlett-Packard Italiana S.p.A.  
 Via G. Di Vittorio 9  
 I-20063 CERNUSCO SUL NAVUGLIO  
 Tel: (2) 903691  
 Telex: 334632  
 A,CM,CP,E,MP,P

Hewlett-Packard Italiana S.p.A.  
 Via Nuova san Rocco A  
 Capodimonte, 62/A  
 I-80131 NAPOLI  
 Tel: (081) 7413544  
 A,CM,CS,E

Hewlett-Packard Italiana S.p.A.  
 Viale G. Modugno 33  
 I-16156 GENOVA PEGLI  
 Tel: (010) 68-37-07 E.C

Hewlett-Packard Italiana S.p.A.  
 Via Turazza 14  
 I-35100 PADOVA  
 Tel: (49) 664888  
 Telex: 430315  
 A,CM,CS,E,MS

Hewlett-Packard Italiana S.p.A.  
 Viale C. Pavese 340  
 I-00144 ROMA  
 Tel: (06) 54831  
 Telex: 610514  
 A,CM,CS,E,MS,P\*

Hewlett-Packard Italiana S.p.A.  
 Corso Giovanni Lanza 94  
 I-10133 TORINO  
 Tel: (011) 682245, 65930B  
 Telex: 221079  
 CM,CS,E

## JAPAN

Yokogawa-Hewlett-Packard Ltd.  
 Inoue Building  
 134B-3, Asahi-cho  
 ATSUGI, Kanagawa 243  
 Tel: (0462) 24-0451  
 CM,C\*,E

Yokogawa-Hewlett-Packard Ltd.  
 3-30-1B Tsuruya-cho  
 Kanagawa-ku, Yokohama-Shi  
 KANAGAWA, 221  
 Tel: (045) 312-1252  
 Telex: 3B2-3204 YHP YOK  
 CM,CS,E

Yokogawa-Hewlett-Packard Ltd.  
 Sannomiya-Oaichi Seimei-Bldg. 5F  
 69 Kyo-Machi Ikuta-Ku  
 KOBE CITY 650 Japan  
 Tel: (078) 392-4791  
 C,E

Yokogawa-Hewlett-Packard Ltd.  
 Kumagaya Asahi Yasoji Bldg 4F  
 4-3 Chome Tsukuba  
 KUMAGAYA, Saitama 360  
 Tel: (0485) 24-6563  
 CM,CS,E

Yokogawa-Hewlett-Packard Ltd.  
 Mito Mitsui Building  
 4-73, San-no-maru, 1-chome  
 MITO, Ibaragi 310  
 Tel: (0292) 25-7470  
 CM,CS,E

Yokogawa-Hewlett-Packard Ltd.  
 Sumitomo Seimei Bldg.  
 11-2 Shimo-sasajima-cho  
 Nakamura-ku  
 NAGOYA, Aichi 450  
 Tel: (052) 5B1-1B50  
 CM,CS,E,MS

Yokogawa-Hewlett-Packard Ltd.  
 Chuo Bldg., 4th Floor  
 5-4-20 Nishinakajima, 5-chome  
 Yodogawa-ku, Osaka-shi  
 OSAKA, 532

Tel: (06) 304-6021  
 Telex: YHP0SA 523-3624  
 A,CM,CP,E,MP,P\*

Yokogawa-Hewlett-Packard Ltd.  
 29-21 Takaido-Higashi 3-chome  
 Suginami-ku TOKYO 16B  
 Tel: (03) 331-6111  
 Telex: 232-2024 YHPTOK  
 A,CM,CP,E,MP,P\*

## JORDAN

**Mouasher Cousins Company**  
 P.O. Box 1387  
 AMMAN  
 Tel: 24907, 39907  
 Telex: 21456 SABCO JO  
 E,M,P

## KOREA

**Samsung Electronics**  
 4759 Shinkil, 6 Dong  
 Youngdeungpo-Ku,  
 SEOUL  
 Tel: 8334311, 8334312  
 Telex: SAMSAN 27364  
 A,C,E,M,P

## KUWAIT

**Al-Khalidya Trading & Contracting**  
 P.O. Box 830 Safat  
 KUWAIT  
 Tel: 42-4910, 41-1726  
 Telex: 2481 Areeg kt  
 A,E,M

**Photo & Cine Equipment**  
 P.O. Box 270 Safat  
 KUWAIT  
 Tel: 42-2846, 42-3801  
 Telex: 2247 Matin P

## LUXEMBOURG

Hewlett-Packard Belgium S.A./N.V.  
 Blvd de la Woluwe, 100  
 Woluwedal  
 B-1200 BRUSSELS  
 Tel: (02) 762-32-00  
 Telex: 23-494 paloben bru  
 A,CM,CP,E,MP,P

## MALAYSIA

Hewlett-Packard Sales (Malaysia)  
 Sdn. Bhd.  
 Suite 2.21/2.22  
 Bangunan Angkasa Raya  
 Jalan Ampang  
 KUALA LUMPUR  
 Tel: 4B3544  
 Telex: MA31011  
 A,CP,E,M,P\*  
 Protel Engineering  
 Lot 319, Satok Rd.  
 P.O. Box 1917  
 KUCHING, SARAWAK  
 Tel: 535-44  
 Telex: MA 70904 Promat  
 Cable: Proteleng  
 A,E,M

## MEXICO

Hewlett-Packard Mexicana, S.A. de C.V.  
 Avenida Periferico Sur No. 6501  
 Tepepan, Xochimilco  
 MEXICO CITY 23, D.F.  
 Tel: (905) 676-4600  
 Telex: 017-74-507  
 A,CP,E,MS,P  
 Hewlett-Packard Mexicana, S.A. de C.V.  
 Rio Volga 600  
 Colonia del Valle  
 MONTERREY, N.L.  
 Tel: 7B-42-93, 78-42-40, 78-42-41  
 Telex: 038-410  
 CS

## MOROCCO

**Doibeau**  
 81 rue Karatchi  
 CASABLANCA  
 Tel: 3041-82, 3068-38  
 Telex: 23051, 22822  
 E  
**Gerep**  
 2 rue d'Agadir  
 Boite Postale 156  
 CASABLANCA  
 Tel: 272093, 272095  
 Telex: 23 739  
 P

## NETHERLANDS

Hewlett-Packard Nederland B.V.  
 Van Heuven Goedhartlaan 121  
 NL 11B1KK AMSTELVEEN  
 P.O. Box 667  
 NL 1080 AR AMSTELVEEN  
 Tel: (20) 47-20-21  
 Telex: 13 216  
 A,CM,CP,E,MP,P  
 Hewlett-Packard Nederland B.V.  
 Bongerd 2  
 NL 2906VK CAPPELLE, A/D IJssel  
 P.O. Box 41  
 NL 2900 AA CAPELLE, IJssel  
 Tel: (10) 51-64-44  
 Telex: 21261 HEPAC NL  
 A,CM,CP

## NEW ZEALAND

Hewlett-Packard (N.Z.) Ltd.  
 169 Manukau Road  
 P.O. Box 26-189  
 Epsom, AUCKLAND  
 Tel: 6B-7159  
 Cable: HEWPACK Auckland  
 CM,CS,E,P\*

Hewlett-Packard (N.Z.) Ltd.  
 4-12 Cruickshank Street  
 P.O. Box 9443  
 Kilbirnie, WELLINGTON 3  
 Tel: 877-199  
 Cable: HEWPACK Wellington  
 CM,CP,E,P  
**Northrop Instruments & Systems Ltd.**  
 Eden House, 44 Khyber Pass Road  
 P.O. Box 9682  
 Newmarket, AUCKLAND  
 Tel: 794-091  
 A,M  
**Northrop Instruments & Systems Ltd.**  
 Terrace House, 4 Oxford Terrace  
 P.O. Box 8388  
 CHRISTCHURCH  
 Tel: 64-165  
 A,M  
**Northrop Instruments & Systems Ltd.**  
 Sturdee House  
 85-87 Ghuznee Street  
 P.O. Box 2406  
 WELLINGTON  
 Tel: 850-091  
 Telex: NZ 3380  
 A,M

## NIGERIA

**The Electronics Instrumentations Ltd.**  
 N68/S70 Oyo Road  
 Oluseun House  
 P.M.B. 5402  
 IBADAN  
 Tel: 461577  
 Telex: 31231 TEIL NG  
 A,E,M,P  
**The Electronics Instrumentations Ltd.**  
 144 Agege Motor Road, Mushin  
 P.O. Box 6645  
 Mushin, LAGOS  
 A,E,M,P

## NORTHERN IRELAND

**Cardiac Services Company**  
 95A Finaghy Road South  
 BELFAST BT 10 0BY  
 Tel: (0232) 625-566  
 Telex: 747626  
 M

## NORWAY

Hewlett-Packard Norge A/S  
 Folke Bernadottesvei 50  
 P.O. Box 355B  
 N-5033 FYLLINGSDALEN (BERGEN)  
 Tel: (05) 16-55-40  
 Telex: 16621 hpnas n  
 CM,CS,E  
 Hewlett-Packard Norge A/S  
 Oesterdalen 18  
 P.O. Box 34  
 N-1345 OESTERAAS  
 Tel: (02) 17-11-80  
 Telex: 16621 hpnas n  
 A\*,CM,CP,E,MS,P

## OMAN

**Khimji Ramdas**  
 P.O. Box 19  
 MUSCAT  
 Tel: 72-22-17, 72-22-25  
 Telex: 3289 BROKER MB MUSCAT  
 P

## PAKISTAN

**Mushko & Company Ltd.**  
 10, Bazar Road  
 Sector G-6/4  
 ISLAMABAD  
 Tel: 28624  
 Cable: FEMUS Rawalpindi  
 A,E,M  
**Mushko & Company Ltd**  
 Oosman Chambers  
 Abdullah Haroon Road  
 KARACHI 0302  
 Tel: 511027, 512927  
 Telex: 2894 MUSHKO PW  
 Cable: COOPERATOR Karachi  
 A,E,M,P\*

## PANAMA

**Electrónico Balboa, S.A.**  
 Apartado 4929  
 Panama 5  
 Calle Samuel Lewis  
 Edificio "Alfa" No. 2  
 CIUDAD DE PANAMA  
 Tel: 64-2700  
 Telex: 3480380  
 Cable: ELECTRON Panama  
 A,CM,E,M,P  
**Foto Internacional, S.A.**  
 P.O. Box 2068  
 Free Zone of Colon  
 COLON 3  
 Tel: 45-2333  
 Telex: 3485126  
 Cable: IMPORT COLON/Panama  
 P

## PERU

**Compañia Electro Médica S.A.**  
 Los Flamencos 145, San Isidro  
 Casilla 1030  
 LIMA 1  
 Tel: 41-4325  
 Telex: Pub Booth 25424 SISIORO  
 Cable: ELMEO Lima  
 A,CM,E,M,P

## PHILIPPINES

**The Onine Advanced Systems Corporation**  
 Rico House, Amoroso Cor. Herrera Street  
 Legaspi Village, Makati  
 P.O. Box 1510  
 Metro MANILA  
 Tel: 85-35-81, 85-34-91, 85-32-21  
 Telex: 3274 ONLINE  
 A,C,E,M

**Electronic Specialists and Proponents Inc.**  
 690-B Epifanio de los Santos Avenue  
 Cubao, QUEZON CITY  
 P.O. Box 2649 Manila  
 Tel: 98-96-81, 98-96-82, 98-96-83  
 Telex: 742-40287  
 P

## POLAND

**Buro Informacji Technicznej Hewlett-Packard**  
 Ul. Stawki 2, 6P  
 PLOO-950 WARSZAWA  
 Tel: 39-59-62, 39-67-43  
 Telex: 812453 hepa pl



# SALES & SUPPORT OFFICES

Arranged alphabetically by country

## PORTUGAL

*Telectra-Empresa Técnica de Equipamentos Eléctricos S.a.r.l.*  
Rua Rodrigo da Fonseca 103  
P.D. Box 2531  
P-LISBON 1

Tel: (19) 68-60-72  
Telex: 12598  
A,C,E,P

## Mundinter

*Intercambio Mundial de Comércio S.a.r.l.*  
P.O. Box 2761  
Avenida Antonio Augusto de Aguiar 138  
P-LISBON  
Tel: (19) 53-21-31, 53-21-37  
Telex: 16691 munter p  
M

## PUERTO RICO

Hewlett-Packard Puerto Rico  
P.O. Box 4407  
CAROLINA, Puerto Rico 00630  
Calle 272 Edificio 203  
Urb. Country Club  
RIO PIEDRAS, Puerto Rico 00924  
Tel: (809) 762-7255  
Telex: 345 0514  
A,CP

## QATAR

*Nasser Trading & Contracting*  
P.O. Box 1563  
DOHA  
Tel: 22170  
Telex: 4439 NASSER  
M

*Scilecharabia*  
P.O. Box 2750  
I'DOHA  
Tel: 329515  
Telex: 4806 CMPARB  
P

## ROMANIA

*Hewlett-Packard Reprezentanta*  
Boulevard Nicolae Balcescu 16  
BUCURESTI  
Tel: 130725  
Telex: 10440

## SAUDI ARABIA

*Modern Electronic Establishment*  
P.O. Box 193  
AL-KHOBAR  
Tel: 44-678, 44-813  
Telex: 670136  
Cable: ELECTA AL-KHOBAR  
C,E,M,P

*Modern Electronic Establishment*  
P.O. Box 1228, Baghdadiah Street  
JEDDAH  
Tel: 27-798  
Telex: 401035  
Cable: ELECTA JEDDAH  
C,E,M,P

*Modern Electronic Establishment*  
P.O. Box 2728  
RIYADH  
Tel: 62-596, 66-232  
Telex: 202049  
C,E,M,P

## SCOTLAND

Hewlett-Packard Ltd.  
Royal Bank Buildings  
Swan Street  
BRECHIN, Angus, Scotland  
Tel: 3101, 3102  
CM,CS

Hewlett-Packard Ltd.  
SOUTH QUEENSFERRY  
West Lothian, EH30 9TG  
GB-Scotland  
Tel: (031) 3311000  
Telex: 72682  
A,CM,E,M

## SINGAPORE

Hewlett-Packard Singapore (Pty.) Ltd.  
P.O. Box 58 Alexandra Post Office  
SINGAPORE, 9115  
6th Floor, Inchcape House  
450-452 Alexandra Road  
SINGAPORE 0511  
Tel: 631788  
Telex: HPSGSO RS 34209  
Cable: HEWPAC, Singapore  
A,CP,E,MS,P

## SOUTH AFRICA

Hewlett-Packard South Africa (Pty.) Ltd.  
P.O. Box 120  
Howard Place  
Pine Park Center, Forest Drive, Pinelands  
CAPE PROVINCE 7450  
Tel: 53-7955, 53-7956, 53-7957  
Telex: 57-0006  
A,CM,CS,E,MS,P  
Hewlett-Packard South Africa (Pty.) Ltd.  
P.O. Box 37066  
Overport  
DURBAN 4067  
Tel: 28-4178, 28-4179, 28-4110  
CM,CS  
Hewlett-Packard South Africa (Pty.) Ltd.  
P.O. Box 33345  
Glenstantia 0010 TRANSVAAL  
1st Floor East  
Constantia Park Ridge Shopping Centre  
Constantia Park  
PRETORIA Tel: 98-1126 or 98-1220  
Telex: 32163  
C,E  
Hewlett-Packard South Africa (Pty.) Ltd.  
Oaphny Street  
Private 8ag Wendywood  
SANDTON 2144  
Tel: 802-5111, 802-5125  
Telex: 89-84782  
Cable: HEWPAC Johannesburg  
A,CM,CP,E,MS,P

## SPAIN

Hewlett-Packard Española S.A.  
c/Entenza, 321  
E-BARCELONA 29  
Tel: (3) 322-24-51, 321-73-54  
Telex: 52603 hpbee  
A,CM,CP,E,MS,P  
Hewlett-Packard Española S.A.  
c/San Vicente S/N  
Edificio Albia II, 7 8  
E-BILBAO 1  
Tel: (944) 423-8306, 423-8206  
A,CM,E,MS  
Hewlett-Packard Española S.A.  
Calle Jerez 3  
E-MADRID 16  
Tel: 458-2600  
Telex: 23515 hpe  
A,CM,E,MP,P

Hewlett-Packard Española S.A.  
Colonia Mirasierra  
Edificio Juban  
c/o Costa Brava 13, 2.  
E-MADRID 34  
Tel: 734-8061, 734-1162  
CM,CP

Hewlett-Packard Española S.A.  
Av Ramón y Cajal 1-9  
Edificio Sevilla 1,  
E-SEVILLA 5  
Tel: 64-44-54, 64-44-58  
Telex: 72933  
A,CM,CS,MS,P

Hewlett-Packard Española S.A.  
C/Ramon Gordillo, 1 (Entlo.3)  
E-VALENCIA 10  
Tel: 361-1354, 361-1358  
CM,CS,P

## SWEDEN

Hewlett-Packard Sverige AB  
Enighetsvägen 3, Fack  
P.O. Box 20502  
S-16120 BROMMA  
Tel: (08) 730-0550  
Telex: (854) 10721 MESSAGES  
Cable: MEASUREMENTS  
STOCKHOLM  
A,CM,CP,E,MS,P  
Hewlett-Packard Sverige AB  
Sunnarvagen 14K  
S-22226 LUND  
Tel: (46) 13-69-79  
Telex: (854) 10721 (via BROMMA office)  
CM,CS  
Hewlett-Packard Sverige AB  
Västra Vintergatan 9  
S-70344 ÖREBRO  
Tel: (19) 10-48-80  
Telex: (854) 10721 (via BROMMA office)  
CM,CS  
Hewlett-Packard Sverige AB  
Frötagatan 30  
S-42132 VÄSTRA-FRÖLUNDA  
Tel: (031) 49-09-50  
Telex: (854) 10721 (via BROMMA office)  
CM,CS,E,P

## SWITZERLAND

Hewlett-Packard (Schweiz) AG  
Clarastrasse 12  
CH-4058 BASLE  
Tel: (61) 33-59-20  
A,CM  
Hewlett-Packard (Schweiz) AG  
47 Avenue Blanc  
CH-1202 GENEVA  
Tel: (022) 32-30-05, 32-48-00  
CM,CP  
Hewlett-Packard (Schweiz) AG  
29 Chemin Château 8loc  
CH-1219 LE LIGNON-Geneva  
Tel: (022) 96-03-22  
Telex: 27333 hpag ch  
Cable: HEWPACKAG Geneva  
A,CM,E,MS,P  
Hewlett-Packard (Schweiz) AG  
Zürcherstrasse 20  
Allmend 2  
CH-8967 WIDEN  
Tel: (57) 50-111  
Telex: 59933 hpag ch  
Cable: HPAG CH  
A,CM,CP,E,MS,P

## SYRIA

*General Electronic Inc.*  
Nuri Basha-Ahna Ebn Kays Street  
P.D. Box 5781  
DAMASCUS  
Tel: 33-24-87  
Telex: 11215 ITIKAL  
Cable: ELECTROBOR DAMASCUS  
E  
Sawah & Co.  
Place Azmé  
Boite Postale 2308  
DAMASCUS  
Tel: 16-367, 19-697, 14-268  
Telex: 11304 SATACO SY  
Cable: SAWAH, DAMASCUS  
M

## TAIWAN

Hewlett-Packard Far East Ltd.  
Kaohsiung Branch  
68-2, Chung Cheng 3rd Road  
Shin Shin, Chu  
KAOHSIUNG  
Tel: 24-2318, 26-3253  
CS,E,MS,P  
Hewlett-Packard Far East Ltd.  
Taiwan Branch  
5th Floor  
205 Tun Hwa North Road  
TAIPEI  
Tel: (02) 751-0404  
Cable: HEWPAC Taipei  
A,CP,E,MS,P

Hewlett-Packard Far East Ltd.  
Taichung Branch  
#33, Cheng Yih Street  
10th Floor, Room 5  
TAICHUNG  
Tel: 289274  
Ing Lih Trading Co.  
3rd Floor 18, Po-la Road  
TAIPEI  
Tel:  
Telex:  
Cable: INGLIH TAIPEI  
A

## THAILAND

*UNIMESA Co. Ltd.*  
Elcom Research Building  
2538 Sukhumvit Ave.  
Bangchak, BANGKOK  
Tel: 393-2387, 393-0338  
Telex: TH81160, 82938, 81038  
Cable: UNIMESA Bangkok  
A,C,E,M  
Bangkok Business Equipment Ltd.  
5/5-6 Dejo Road  
BANGKOK  
Tel: 234-8670, 234-8671,  
234-8672  
Cable: BUSIQUIPT Bangkok  
P

## TRINIDAD & TOBAGO

*Caribbean Telecoms Ltd.*  
P.O. Box 732  
50/A Jerningham Avenue  
PORT-OF-SPAIN  
Tel: 624-4213, 624-4214  
A,CM,E,M,P

## TUNISIA

*Tunisie Electronique*  
31 Avenue de la Liberté  
TUNIS  
Tel: 280-144  
E,P

## Tunisia

*1 ter. Av. de Carthage*  
TUNIS  
Tel: 253-821  
Telex: 12319 CABAM TN  
M

## TURKEY

*Teknim Company Ltd.*  
Riza Sah Pehievi  
Caddesi No. 7  
Kavaklidere, ANKARA  
Tel: 275800  
Telex: 42155  
E  
EMA, Muhendislik Kollektif Sirketi  
Mediha Eldem  
Sokak 41/6  
Yüksel Caddesi, ANKARA  
Tel: 17-56-22  
Cable: Ematrade  
M

## UNITED ARAB EMIRATES

*Emilac Ltd.*  
P.O. Box 1641  
SHARJAH  
Tel: 354121, 354123  
Telex: 68136  
E,M,P,C

## UNITED KINGDOM

see: GREAT BRITAIN  
NORTHERN IRELAND  
SCOTLAND

## UNITED STATES

**Alabama**  
Hewlett-Packard Co.  
700 Century Park South  
Suite 128  
BIRMINGHAM, AL 35226  
Tel: (205) 822-6802  
CM,CS,MP  
Hewlett-Packard Co.  
P.O. Box 4207  
8290 Whitesburg Drive, S.E.  
HUNTSVILLE, AL 35802  
Tel: (205) 881-4591  
CM,CP,E,M\*

**Alaska**  
Hewlett-Packard Co.  
1577 "C" Street, Suite 252  
ANCHORAGE, AK 99510  
Tel: (206) 454-3971  
CM,CS\*\*

**Arizona**  
Hewlett-Packard Co.  
2336 East Magnolia Street  
PHOENIX, AZ 85034  
Tel: (602) 273-8000  
A,CM,CP,E,MS

Hewlett-Packard Co.  
2424 East Aragon Road  
TUCSON, AZ 85702  
Tel: (602) 889-4631  
CM,CS,E,MS\*\*

**Arkansas**  
Hewlett-Packard Co.  
P.O. Box 5646  
Brady Station  
LITTLE ROCK, AR 72215  
Tel: (501) 376-1844, (501)  
664-8773  
CM,MS

**UNITED STATES (Cont.)****California**

Hewlett-Packard Co.  
7621 Canoga Avenue  
CANOGA PARK, CA 91304  
Tel: (213) 702-8300  
A,CM,CP,E,P

Hewlett-Packard Co.  
1579 W. Shaw Avenue  
FRESNO, CA 93771  
Tel: (209) 224-0582  
CM,MS

Hewlett-Packard Co.  
1430 East Orangethorpe  
FULLERTON, CA 92631  
Tel: (714) 870-1000  
CM,CP,E,MP

Hewlett-Packard Co.  
5400 W. Rosecrans Boulevard  
LAWDALE, CA 90260  
P.O. Box 92105  
LOS ANGELES, CA 90009  
Tel: (213) 970-7500  
CM,CP,MP

Hewlett-Packard Co.  
3939 Lankershim Blvd.  
NORTH HOLLYWOOD, CA 91604  
Tel: (213) 877-1282  
Regional Headquarters  
Hewlett-Packard Co.  
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